

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

PEM0044 – ESSENTIAL MATHEMATICS
(All sections / Groups)

27 OCTOBER 2017
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 4 pages with 4 questions only, excluding the cover page.
2. Attempt ALL FOUR questions.
3. Write all your answers in the Answer Booklet provided. Show all necessary workings.
4. The formula sheet is attached at the end of this question paper.

Question 1 (25 marks)

- (a) Perform the indicated operation and rationalize the denominator.

$$\frac{2y-1}{7y+3} + \frac{5}{3-\sqrt{y}}$$

(7 marks)

- (b) Simplify the following expression. Leave your final answer with positive exponents.

$$\frac{a^2b^4}{a^5c} \times \sqrt{\frac{4b^8}{a^6c^2}}$$

(5 marks)

- (c) Solve the following equation and inequality:

(i) $|3x - 7| = x + 1$ (4 marks)

(ii) $-3x^2 + 2 \leq -x$ (5 marks)

- (d) Find the equation of a line that is perpendicular to the line $y = -2x + 5$ and passes through a point $(-3, 8)$.

(4 marks)

Continued...

Question 2 (25 marks)

(a) Perform the indicated operation:

$$\left(\begin{bmatrix} 3 & 2 \\ -1 & 0 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 3 & -4 \end{bmatrix} \right)^T$$

(5 marks)

(b) Consider the following matrix,

$$\mathbf{A} = \begin{bmatrix} 1 & 1 & -1 \\ 1 & 2 & -1 \\ -1 & -1 & 2 \end{bmatrix}$$

(i) Find the inverse of matrix \mathbf{A} . (15 marks)

(ii) Using the inverse found in (i) above, solve the following system:

$$\begin{aligned} x + y - z &= 1 \\ x + 2y - z &= -3 \\ -x - y + 2z &= 2 \end{aligned}$$

(5 marks)

Question 3 (20 marks)

(a) An arithmetic sequence has the first term a and the common difference d . The tenth term is 69 and the sum of the first 30 terms is four times the sum of the first 10 terms. Evaluate a and d .

(12 marks)

(b) Consider a geometric sequence that has a first term $1/9$ and an 8th term of 243.

(i) Find the common ratio. (4 marks)

(ii) Find the third term. (2 marks)

(iii) Find the sum of the first five terms. (2 marks)

Continued...

Question 4 (30 marks)

a) Find $\frac{dy}{dx}$ for the following function:

i) $y = 3x^3 + 5x - \sqrt{x} + 4$ (4 marks)

ii) $y = (2x + 1)(1 - x)^2$ by using the product rule. (6 marks)

b) Find $f''(x)$ if $f(x) = \frac{1}{2x + 3} - 4$. (6 marks)

c) Evaluate the following integrals:

i) $\int \left(5x^4 + \frac{2}{3}x^2 - \sqrt{x} + 7 \right) dx$ (5 marks)

ii) $\int (2x\sqrt{1+x^2}) dx$ by using substitution method (5 marks)

iii) $\int_{-2}^4 (3x - 2) dx$ (4 marks)

End of Page.

COURSE CODE: PEM0044

COURSE NAME: ESSENTIAL MATHEMATICS

FORMULAE

1. Differentiation

The Power Rule:

$$\frac{d}{dx} [x^n] = nx^{n-1}$$

The Product Rule:

$$\frac{d}{dx} [uv] = u \frac{dv}{dx} + v \frac{du}{dx}$$

The Quotient Rule:

$$\frac{d}{dx} \left[\frac{u}{v} \right] = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$$

The Chain Rule:

If n any real number, $u = g(x)$ is differentiable, then

$$\frac{d}{dx} [u^n] = nu^{n-1} \times \frac{du}{dx}$$

2. Integration

i) $\int k \, dx = kx + C$

ii) $\int x^n \, dx = \frac{x^{n+1}}{n+1} + C, \quad n \neq -1$

iii) $\int cf(x) \, dx = c \int f(x) \, dx$

iv) $\int [f(x) \pm g(x)] \, dx = \int f(x) \, dx \pm \int g(x) \, dx$